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September 1990

THE MAC FLYER - For Greater Safety in MAC Air Operations

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Reflections of Nature

Be wary of ideal conditions . . .

By Maj. Daniel G. Halpern
7 AREFS, Carswell AFB, Texas

Some days are just made to be spent outdoors. The sky is a deep, dark blue, the sun is bright, and there is a cool, gentle breeze. Thin, white cirrus clouds float gently through the sky. On those crisp, clear days, take yourself away from the city, crowds, cars, and congestion. Spend some time in the great outdoors and savor the warm sunshine and fresh air. Take the opportunity to genuinely enjoy the wilderness and let your senses come alive.

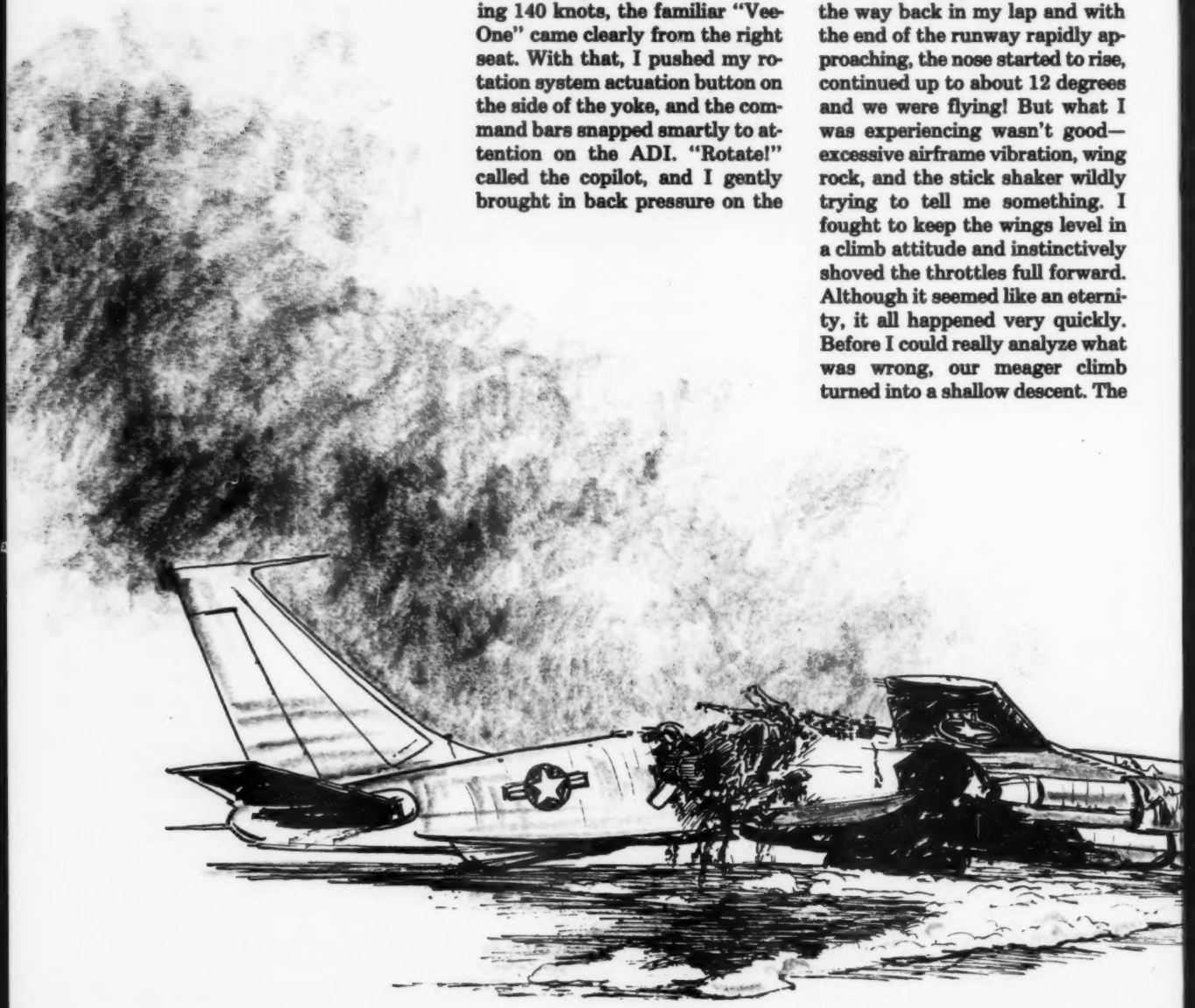
There is a special place I like to visit on bright, sunny days—out in the woods, down by the creek, through the meadow, and near the mountains. The woods are thick and lush and leaves are big and green, like pages in a children's story book. The only sounds are the gentle rustling of leaves from the cool breeze and birds softly singing in the trees. I close my eyes for a moment and listen . . . .

The day was absolutely gorgeous. Our first leg earlier in the morning had gone flawlessly—clear skies, smooth air, and cooperative air traffic controllers. Now on the ground, things were going equally as well. The fuel trucks were standing by as we blocked in; cargo and passenger loading was completed in minimum time, and our ATC clearance came through precisely as filed. We moved away from the terminal right on time and negotiated our way through the familiar maze of taxiways leading to the active runway. We took our place in the line of aircraft patiently awaiting takeoff clearance.

This flight, a simple air transport sortie, was to be as routine and basic as one could possibly be; just the way I liked it. The crew, all highly experienced, were also

1990 MAC Flight Safety Writing Contest—Third Place

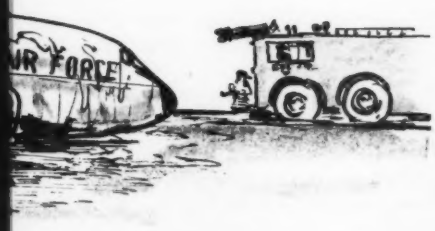
close friends. As such, the cockpit environment was relaxed and casual. We chatted about a variety of things—what we would do tonight at our destination, the upcoming November elections, mortgage rates, and the weather. Basically, we were just killing time, anticipating our trip westward. Before we could solve all the problems of the world, however, we had moved up and were Number 1 for takeoff. That deep blue sky calmly awaited our departure. As I swung the nose around, centered it up on the broad stripe, and gazed down along the two miles of smooth, white concrete, I could feel the reassuring power of our trusty Pratt and Whitneys as they came up and stabilized, pressing us firmly against our seats. Passing 140 knots, the familiar "Vee-One" came clearly from the right seat. With that, I pushed my rotation system actuation button on the side of the yoke, and the command bars snapped smartly to attention on the ADI. "Rotate!" called the copilot, and I gently brought in back pressure on the control column to effect the required eight-degree nose up takeoff attitude. Strangely enough, though, the nose felt "heavy" and didn't want to come up. Well, just a touch more back pressure should help. But even with that, we were still screaming down the runway in a three-point attitude. For the first time in as long as I can remember, I started to get an uneasy feeling about the situation. Finally, with the yoke all the way back in my lap and with the end of the runway rapidly approaching, the nose started to rise, continued up to about 12 degrees and we were flying! But what I was experiencing wasn't good—excessive airframe vibration, wing rock, and the stick shaker wildly trying to tell me something. I fought to keep the wings level in a climb attitude and instinctively shoved the throttles full forward. Although it seemed like an eternity, it all happened very quickly. Before I could really analyze what was wrong, our meager climb turned into a shallow descent. The



left wing dropped and dug itself into the ground, the windscreen filled with the view of an open field, and the rest just isn't very clear.

It didn't take long for investigators to figure this one out—wing leading and trailing edge flaps fully stowed and flush with the wing surfaces; the flap handle in the full up position. Yes sir, we never opened our checklist and simply skipped Item 4 of the "Before Takeoff Check: FLAPS—SET FOR TAKEOFF," right there in bold black letters on yellow paper. We could have easily skipped something as incidental as Item 6 "LIGHT ON" and gotten away with it; but no, we missed the critical one. Awaiting takeoff clearance, we had the perfect opportunity to review normal and emergency procedures, recheck the NAVAIDS and routing for the SID, complete the checklist, and perform a safety check. We did none of those. I suppose we thought we were too good for that.

Imagine! The weather was *ideal*, the crew was in *excellent* physical condition, and the aircraft was operating *perfectly*. We were a highly experienced crew, the very best. But we had become so casual and complacent with our routine that we never opened a checklist. We *violated* one of the *basic rules of flying*—one taught in every flight training course right from the very beginning: CHECKLIST DISCIPLINE.



Deep in the woods, a fresh, clear, mountain stream flows gently through the trees. It's fun to just sit on the bank and watch the water rushing swiftly around the rocks. The current seems to always be on the go. Sometimes I splash the water on my hands and face. It feels cold and refreshing. Then I close my eyes for a moment, let my senses come alive, and feel . . . .

The day was crystal clear. Our destination airport ATIS was reporting calm winds with ceiling and visibility unlimited. Sure enough, we acquired the field miles away, completed the descent check, and maneuvered for a visual approach. This flight had gone perfectly, except for some strong headwinds and ATC vectors putting us slightly behind schedule. So, as we descended toward the airport, we purposely kept our airspeed up, hoping to get the flight back into the "on-time" category. Turning onto a visual downwind, I glanced over to my left, momentarily observing the aircraft commander with the airplane solidly in his grip—slightly gray, wrinkles around the eyes, and roughened hands indicating a long, distinguished flying career. Captain Jack, probably the most experienced pilot with whom I'd ever flown, had seen about everything from A to Z. Although I had been flying the line for quite some time, I always welcomed the opportunity to fly with someone so experienced. As we turned onto the base leg, with clearance to land, I patiently awaited the call for the final checklist. For the first time in as long as I can remember, however, I was ever so slightly concerned about the state of our approach. We were still high, fast, and clean as we turned onto final approach, the runway looming closer and closer. Maybe we tried *too* hard to make up a few extra minutes. Oh well, if ever there was a pilot who could make this approach work out, it would be Jack. Sure enough, he appeared to have firm control of the ship, eyes intently fixed on the aim point. My hand crept slowly over to the flap handle, awaiting the command of execution. "Before Landing Checklist!" ordered Jack. Finally! With the lever in the first detent, the flaps started to slide back and down into the slipstream, slats dropping uniformly forward into position. Next came the landing gear, followed by final flaps, a check of hydraulic systems and fuel panel, and the checklist was complete. Ready for landing. But were we really ready? The power was back at idle and we were still high, fast, and steep. Before I could react, however, the threshold slid beneath the nose. Jack coaxed us into the flare and WHUMP . . . we hit the ground like a ton of bricks. Back into the air we went, with considerable energy, but Jack held firmly to that landing attitude. BAM! Back into the air again, although not as high this time. The power was still back at idle; the aircraft, incredibly, was still under control—but we were using up lots of runway, fast. Finally, THUD—landing Number 3. We were solidly on the ground with every braking device we had coming into full operation. With brakes squealing and reversers howling, the end of the runway was rapidly approaching. Beyond that lay a thousand feet of asphalt overrun, approach lights, and a steep drop-off. What could we do now? A go-around or refused landing was no longer an option, and our stopping capability on the remaining runway was seriously in question. We were going too fast to turn or ground loop, so we just went straight—straight off the end of the runway, past the overrun, into the approach lights, and

right over into that ditch. The rest isn't very clear. I think the fuselage broke apart, fuel tanks ruptured, and there was a big fire.

Amazing! The weather was *ideal*, the crew was in *excellent* physical condition, and the aircraft was operating *perfectly*. We were a highly experienced crew; the very best. But good 'ole Jack felt he was too good to take the airplane around and try again, and I guess I had too much confidence in his abilities. No, I wasn't the aircraft commander, but I had every right and responsibliity to call for a go around. Unfortunately, I became so caught up with the copilot syndrome, I just sat idly by and did nothing. We *violated* one of the *basic rules of flying*—one taught in every flight training course right from the very beginning: If the final becomes unstable or if you are not comfortable with the approach, GO AROUND. Remember, if in doubt, GO AROUND.

Beyond the stream and woods is a huge clearing—the biggest, most beautiful meadow you've ever seen. The flowers are in full bloom, and the sweet fragrance is almost hypnotizing. In the mornings, the deer come down from the hills to graze. If you're still and quiet, they will almost walk right up to you. It's relaxing to just stand there among the flowers and tall grass and absorb the warm sunshine. I take a deep breath, close my eyes for a moment, and experience . . . .

The day was beautiful. We had a very simple mission planned: Take off, refuel a flight of Reserve F-4s over the Arizona desert, and return to the pattern for some local transition. So far it had gone like clockwork. The crew chiefs were standing by at the aircraft when we arrived; engine start, taxi, and takeoff were accomplished exactly as scheduled, and the F-4s even showed up precisely when and where expected. On the en route descent, we pulled out our approach plates, thoroughly reviewed approach procedures, set up our NAVAIDs, and rechecked weather. Ceiling and visibility were unlimited with calm winds. As the instructor pilot aboard, I would be spending the next couple of hours in the traffic pattern checking out a "requal" pilot who had recently arrived in my unit from the Air Staff.

I had flown approaches to this field countless times before. I could even tell where we were on the approach just by looking at ground references. The new housing development was just off to the left about eight miles out, the interstate highway sliced under the nose at a 45-degree angle just inside the final approach fix, and "food row," the boulevard leading out to the base, paralleled our course just to the right.

After two or three approaches, it became quite apparent that a simple afternoon in the pattern was going to be a little more of a challenge. Four years behind a desk is enough to make anyone a little rusty in the cockpit, but this fellow was going to make me earn every penny of my instructor pay. Constant instruction on the very basics— pitch, power control, and trim—plus techniques on the use of fuel flow, configurations, and crew coordination, were keeping my hands full, not to mention those incessant calls from approach control to other aircraft in the pattern. Just about the only relief I was getting came on climbout when approach control would reaffirm we were in "radar contact." At least the controller was helping me out since this "requal" certainly wasn't. As we made our fifth or sixth approach, I was "buried" in the cockpit trying to balance the fuel panel, recheck our configuration, and complete the checklist. We crossed the Final Approach Fix, I called Tower to report "gear down," and the "requal" initiated the descent to the MDA. It was then that I took a really good look outside for the first time in a long while. There, just in front and to the right was some type of high wing Cessna, a '150 or '172, white with blue trim, almost camouflaged against the sky. We were so close I could see the small craft's pilot, but it was too late to maneuver. It crossed right in front of us to the left and our left wing sliced cleanly through his tail with that awful sound of tearing metal. The rest isn't very clear—lots of buffeting, roll, and a view of the Arizona desert in the windscreen.

"Before I could really analyze what was wrong, our meager climb turned into a shallow descent."

Incredible! The weather was *ideal*, the crew was in *excellent* physical condition, and the aircraft was operating *perfectly*. I was highly experienced; the very best. But I had become so involved with instructing and doublechecking every little item, I didn't even bother to look outside on a clear VFR day. I knew perfectly well VFR traffic conflicts often occurred along that wide, well-defined interstate, but I was lulled into a false sense of security by the term "radar contact." I *violated* one of the *basic rules of flying*—one taught in every flight training course right from the very beginning—even when in radar contact, CLEAR. Remember, CLEAR.

At the far end of the meadow lies the biggest, most majestic range of mountains you can imagine. Snow-capped year around, they seem to reach out and touch the heavens. Just to cross them, you must fly like the eagle. The hills are especially striking in the late afternoon. The bright yellow sun turns to a beautiful fiery red as it drops below the tallest peaks. The red rays are so vibrant and well defined that they look like a painting. I could sit and gaze toward the west for hours. I look closely and see . . . .

The weather was superb for flying. A beautiful blue sky, radiant sun, and a cool gentle ocean breeze. The flight was scheduled as a simple airlift mission—your basic flight from point A to point B. Preflight, engine start, and taxi were all routine. We even had some time at the hammerhead to complete our checklists, discuss the departure routing, and review normal and emergency procedures. Before long, we were accelerating down the runway, engines purring at takeoff thrust, distance-remaining markers rushing past, and the same thrill of takeoff I'd felt so many times before over the years. Shortly after passing refusal speed, there came another feeling I hadn't experienced before. From the left side came an intense but muffled BANG, accompanied by a brilliant flash. The nose slewed over to the left, the Number 1 engine fire light illuminated, and someone in the cockpit shouted "ENGINE FAILURE!" I instinctively ruddered the nose back toward the centerline, shoved the throttles full forward, and applied forward pressure on the yoke to ensure optimum nosewheel contact and gain extra airspeed. With the end of the runway approaching, I smoothly brought the nose up, held the wings level, and started a gentle climb. An additional crewmember quickly came forward and reported fire around the Number 1 engine cowling and on the wing. With the authority of many years of experience, I called for the Engine Fire/Engine Shutdown Checklist, ordered the copilot to start dumping fuel, directed radio calls to Tower to declare an emergency, and sent the scanner back to monitor the wing from the aft window. As a result of the visible fire reported on the wing, my immediate concern was to get the aircraft back on the ground as quickly as possible. I started a gradual left turn back toward the field. I suppose I was so preoccupied with the number of things I was trying to accomplish so quickly, like emergency procedures checklists and radio calls, that I didn't really notice the aircraft attitude. I was insidiously pulling further and further back on the control column to gain altitude while slowly increasing bank to get back to the field. It wasn't until someone in the cockpit yelled "AOA!" that I became painfully aware of our predicament—too much bank and back pressure—but it was too late. As we entered a severe buffet, I tried to level the wings, but by then the ailerons were stalled and momentum was working against me. There wasn't sufficient altitude to break the stall. The airplane simply rolled over and augered in! It all happened very quickly. I hadn't even had time to collect my wits or really analyze the emergency.

Unbelievable! The weather was *ideal* and the crew was in *excellent* physical condition. No, the airplane wasn't exactly operating perfectly this time, but without a doubt, it was flyable—light gross weight, cool temperature, low pressure altitude, plenty of power. All performance data indicated outstanding engine-out capability. I was highly experienced, the very best. But I became so involved with minor details like emergency procedure checklists and unnecessary radio calls, at an inappropriate time, that I didn't analyze the emergency, follow our plan to recover the aircraft, or maintain aircraft control. I *violated* what is *absolutely, unquestionably* the most *basic rule of flying*—the one taught in every flight training course right from the very beginning: FLY THE AIRPLANE.

On bright sunny days, when the sky is blue and there is a cool, gentle breeze, get away and treat yourself to the beauty of nature. Take a walk through the woods, stop to watch the rushing brook, listen to the birds sing, smell the flowers in the meadow, and behold the sun as it slowly drops behind the towering mountains. Breathe deeply and inhale fresh, country air. The great outdoors contains countless stories. Take time to enjoy the reflections of nature. Relax and listen carefully . . . CHECKLIST DISCIPLINE . . . GO AROUND . . . CLEAR . . . and above all else, FLY THE AIRPLANE.

Major Halpern, a senior pilot, is currently a KC-135 IP with approximately 3,000 flying hours. He previously served as a KC-135 AC at Fairchild AFB, Wash., a T-37 IP at Sheppard AFB, Texas, and a B-52 pilot at Wurtsmith AFB, Mich.

Significant Factors

How important could seven knots of wind be?

When reacting to an emergency, sometimes an aircrew can do everything they have been trained to do, and still have something of a seemingly minor nature turn an incident into a disaster. In this month's mishap, seven knots of wind caused what should have been a significant, yet injury-free, incident into one that cost 55 lives.

FLIGHT HISTORY

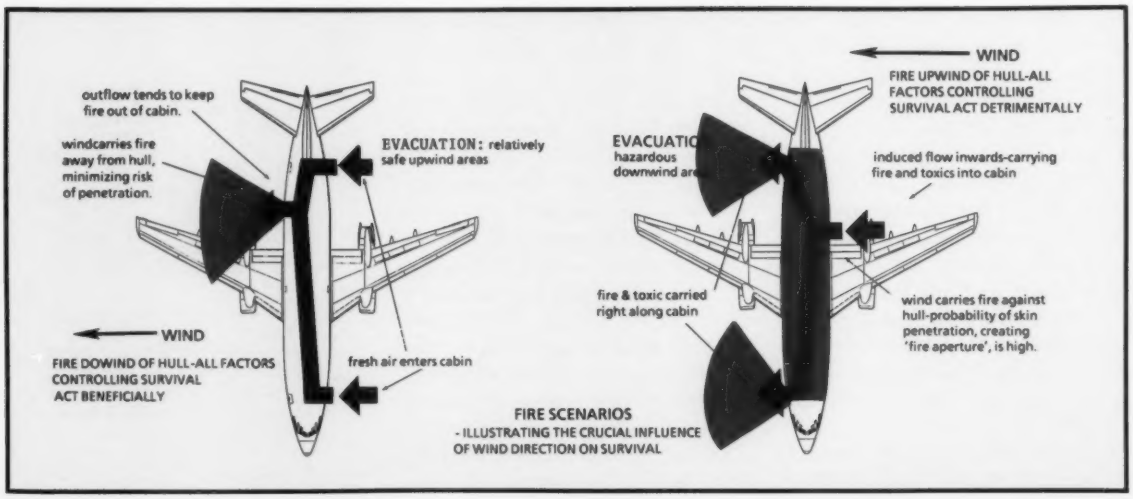
Two pilots and four flight attendants reported for British Airtours Flight KT28M, a Boeing 737-236, originating from Manchester, England, at 0500 the morning of 22 August 1985. Engines were started by the copilot and no abnormalities were observed during the start sequence. The aircraft commander requested taxi clearance at 0608 and moved the aircraft to the holding point of Runway 24.

The flight was cleared for takeoff at 0612 with the wind reported as 250 degrees at seven knots. During takeoff roll, the aircraft commander made the routine call of "eighty knots," and 12 seconds later a "thump" was heard.

The aircraft commander immediately ordered "stop," pulled off power, and selected reverse thrust on both engines. He then checked that speed brakes were extended. The highest indicated air speed achieved was 126 knots.

The copilot had applied maximum wheel braking. However, because the AC considered a possible cause of the "thump" to be tire failure and since there was considerable runway remaining, he directed "Don't hammer the brakes, don't hammer the brakes."

The copilot responded by modulating the braking effort. As the aircraft slowed through 85 knots, which was 45 seconds after the start of the takeoff run and nine seconds after the "thump," the aircraft commander started to inform ATC they were abandoning takeoff. The fire alarm on the flight deck began ringing almost coincident with this transmission, and the AC added "It looks as though we've got a fire on Number 1." ATC responded, "Right, there's a lot of fire, they're (CFR) on their way now." As ground speed passed 50 knots, the AC asked ATC if he needed to evacuate the passengers. The controller replied "I would, via the starboard side." This message was passed 25 seconds after the "thump," and 20 seconds before the aircraft stopped.


outflow tends to keep fire out of cabin.
windcarries fire away from hull, minimizing risk of penetration.
EVACUATION: relatively safe upwind areas
WIND
FIRE DOWIND OF HULL-ALL FACTORS CONTROLLING SURVIVAL ACT BENEFICIALLY
fresh air enters cabin
WIND
FIRE UPWIND OF HULL-ALL FACTORS CONTROLLING SURVIVAL ACT DETRIMENTALLY
EVACUATIO
hazardous downwind ar
induced flow inwards-carrying fire and toxics into cabin
fire & toxic carried right along cabin
wind carries fire against hull-probability of skin penetration, creating 'fire aperture', is high.
FIRE SCENARIOS
- ILLUSTRATING THE CRUCIAL INFLUENCE OF WIND DIRECTION ON SURVIVAL

Six seconds later, the aircraft commander initiated the turn into taxiway Delta and broadcast over the cabin address system for his crew to evacuate from the right side of the aircraft.

Immediately after the aircraft stopped, the aircraft commander ordered the copilot to run the engine fire drill on the left engine and, since the evacuation was to be carried out on the right side, to shut down the right engine. The aircraft came to a rest on a heading of 315 degrees True.

The passenger evacuation drill, a non-memory drill, was read by the copilot from the Quick Reference Handbook. Before they were able to complete the checklist, the aircraft commander saw fuel and fire spreading forward on the left side of the aircraft. He opened the copilot's right sliding window and ordered the copilot to evacuate. Both pilots used the fabric escape strap.

Passengers in rows 1-3 appear to have been initially oblivious of the fire which issued from the engine after the "thump," However, most of those seated aft of row 5, and particularity those aft of row 14 on the left side, were immediately aware of an intense fire. The flames caused some cracking and melting of windows, even before the aircraft stopped, with some associated smoke in the aft cabin.

The purser (senior flight attendant) had confirmed the evacuation with the AC and repeated the evacuation call a number of times over the PA system. Then, as the aircraft was coming to a halt, he went to the right front (R1) door to open it and release the inflatable escape slide. The door unlocked normally but, as it was opening, the slide container lid jammed on the doorframe, preventing further movement. After spending a short time trying to clear the restriction, the purser suspended further effort and crossed to the L1 door. He cracked it open, confirmed the forward spread of the fire was slow enough to allow evacuation, opened it fully, and confirmed the inflation of the slide. This was achieved about 25 seconds after the aircraft had stopped and coincident with the initiation of foam discharge from the first fire vehicle on the scene. Evacuation began on the left side under supervision of another flight attendant who had freed passengers jammed together between the forward galley bulkheads.

The purser returned to the R1 door, lifted the slide pack to close the slide container lid, and cleared the obstruction. He succeeded in opening the door about one minute and ten seconds after the aircraft stopped and again confirmed the automatic inflation of the slide. Smoke emanating from the rear cabin quickly reached the galley area and soon became more dense and acrid. When smoke began to threaten severe incapacitation, the forward cabin crew vacated the aircraft.

As the aircraft had come to a halt, and at the urging of other passengers, a young woman sitting beside the right overwing exit had attempted to open it by pulling on her right hand armrest mounted on the exit hatch. Her companion, in the next seat, stood and reached over her to pull the handle located at the top of the hatch marked "Emergency Pull." The hatch, weighing 48 lbs, fell into the aircraft, trapping the young woman in her seat. With the help of a man in the row behind the woman, the hatch was removed. Passengers then began to escape through the overwing exit. This exit was available about 45 seconds after the aircraft stopped.

During the latter stages of the rejected takeoff, and just as the aircraft turned towards taxiway Delta, the right rear (R2) door was seen by outside witnesses to be open. A flight attendant was initially visible in the doorway, but as the aircraft stopped, the door and slide were obscured by thick black smoke. No one escaped through this door. Two passengers remember seeing one of the two flight attendants assigned to the rear of the aircraft struggling to direct passengers. Neither flight attendant survived.

As the aircraft stopped, the aft cabin was suddenly filled with thick black smoke which panicked passengers in that area. Some of them stumbled and collapsed in the aisle, forcing others to go over the seat-backs towards the center cabin area. A passenger from the front row looked back as he waited to exit the aircraft and saw a mass of people tangled together and struggling in the center section. Apparently they were incapable of moving forward; he stated "People were howling and screaming."

Survivors from the front six rows described a roll of thick black smoke clinging to the ceiling and moving rapidly forward along the cabin. On reaching the forward bulkheads, it curled down and began moving aft, filling the cabin. Some forward passengers became engulfed in smoke despite their close proximity to front exits. All described a single breath as burning and painful, immediately causing choking. Some passengers used clothing or hands over their mouths in an attempt to filter the smoke; others attempted to hold their breath. They experienced drowsiness and disorientation and, while being jostled and pushed, were forced to feel their way along the seat rows towards the exits. Some stated "The smoke generated an immediate sense of panic."

In total, 17 passengers escaped through the L1 door, 34 through the R1 door, and 27 through the overwing exit.

ANALYSIS

Many factors affecting this mishap should have geared events towards a favorable outcome. The cabin was initially intact, the aircraft remained mobile and controllable, and no one had been injured during the abandoned takeoff. The volume of fuel involved, although capable of producing an extremely serious fire, was relatively small compared with the volume typically carried at takeoff. The mishap occurred at a well-equipped major airport with fire protection considerably in excess of that required for this size aircraft, and fire response was on scene within 30 seconds of the aircraft stopping—yet 55 lives were lost.

All described a single breath as burning and painful, immediately causing choking.

There is no direct evidence of when the fire started, but there is little doubt that it ignited fuel released when parts from the damaged engine punctured the wing. The fire damage on the wreckage identified two quite distinct and separate patterns, which were clearly caused by the two phases of the fire; its initial "dynamic" phase while the aircraft was still at speed on the runway and the later "static" phase after the aircraft had slowed and turned off.

As the aircraft decelerated, the turbulent wake, which had contained much of the leaking fuel and sustained the dynamic fire plume trailing the aircraft, decayed. The fire transitioned into quasi-static fire burning above the increasingly large pool of fuel trailing behind the aircraft. As the aircraft turned onto Delta taxiway, the relative wind changed from a slight crosswind from the right to a larger but still slight crosswind component from the left, placing the cabin downwind of the fire for the first time. Photographs showed that while the aircraft continued moving, the resultant velocity vector trailed aft sufficiently to prevent the pool-fire plume from being swept over the cabin section of the fuselage. However, as it slowed to a halt, the resultant vector moved progressively forward until, as the aircraft came to rest, smoke completely enveloped the rear fuselage. This included the R2 door which had been opened just as the aircraft started to turn off. From then on, the fire was driven directly against the fuselage.

Although the wind was only some 5-7 knots, a strength so slight as to be a relatively insignificant factor in terms of aircraft handling, there is a powerful body of evidence clearly showing that the influence of the wind on this mishap was paramount. Not only did it drive the static fire plume against and beneath the hull, making a more rapid penetration of the aluminium alloy fuselage inevitable, it created an aerodynamic pressure field around the fuselage which, once doors and exits were opened on the side opposite to the fire, induced the products of the external fire into and down the length of the cabin interior. In turn, some interior materials ignited, leading to the development of a fire inside the cabin.

PROBABLE CAUSE

The left engine failure was caused by an explosive rupture of the combustion chamber outer case. The ejected dome of the Number 9 combustor can and a small section of the fan case struck an underwing fuel tank access panel creating a hole which had an area of 42 square inches. The fire ignited when fuel from the punctured wing tank access panel came into contact with combustion gases escaping from the damaged engine. The decision to turn the aircraft to the right had a critical effect on the fire by placing it upwind of the fuselage. The wind was the principal factor controlling the fire's behavior.

APPLICATION TO MAC

How many pilots would take into account a 7-knot wind when faced with the circumstances this crew had? On the surface, wind direction appeared to be inconsequential, yet not taking the wind into account contributed to the death of 55 people. It may well be that this is a factor that has not yet received the level of attention it may deserve. Once again, it's up to the aircraft commander to maximize everyone's chance of survival.

Adapted and Courtesy of *Her Majesty's Stationery Office.*

SCNS—The Golden Fruit of Hercules

The Avionics Upgrade

By Maj. Paul W. Schoell
34 TATG, Little Rock AFB, Ark.
and Mr. William C. Smith

Since its humble beginning in Burbank, Calif., in August 1954, Lockheed's C-130 has struggled for a share of the glory bestowed upon the more glamorous flying machines of its own and later eras. Although praised from early on by everyone, from flight test crews to combat pilots, the solid, stoic bird dubbed Hercules has unerringly played the draft horse role in deference to other airborne prancers and high-steppers. Over its nearly forty-year life span, Hercules has changed very little while aircraft technology has advanced by giant strides.

Granted, the proud son of Zeus now sports that signature bulbous nose, absent at its birth. Through its tempestuous teens and twenties, Herk gained strength and stamina from basic improvements such as bigger engines, a beefed-up fuselage, and improved flight instruments. Yet, through all its trials, Hercules' suite of navigation gear, so critical to precise, all-weather global operations, has changed surprisingly little. C-130 aircrews have consistently relied upon map-reading skills and the talents of a navigator who used radar, Doppler, the sun, the stars, and sometimes even the grace of God, to safely steer Hercules across oceans and over targets. But, in this new decade, as with changing time, Hercules is also changing as high technology finally finds its way to the C-130 flight deck.

According to myth, the Greek god Hercules traveled to the world's end to win the golden apples of the Hesperides. For the Lockheed Hercules, which has crisscrossed the breadth of our world since its inaugural flight, the golden fruit has finally arrived in the form of an unprecedented systems retrofit—the C-130 Self-Contained Navigation System (SCNS).

In 1980, MAC conducted an operations review called Close Look II to assess and prioritize, among other items, needs of its airlift forces. From that review, the Number 1 recommendation was development and acquisition of a precise, self-contained navigational system for the Hercules. The desired system would afford precision navigation capability regardless of any electronic countermeasures. To initiate procurement, a statement of need for the new system was validated in early 1981. Funding was appropriated in fiscal year 1983. On 28 June 1981, the contract to design and build the C-130 SCNS was awarded to Smiths Industries, Ltd., formerly Lear-Siegler, Inc., Instruments Division, of Grand Rapids, Mich.

From early on in the SCNS development process, there was spirited debate and discussion as to precisely what functions the system would perform and what avionics features it would integrate. However, from the outset, designers and reviewers alike, saw the tremendous potential promised by a truly in-

SCNS Aircraft Equipment Differences

MAJOR SYSTEMS REMOVED

- APN-147 Doppler
- ASN-35 Doppler Computer
- ARN-131 Omega Navigation System
- Most comm/nav radio control heads
- ASN-24 AWADS computer
- PINS or dual INS

MAJOR SYSTEMS ADDED

- SNU-84 Inertial Navigation System
- APN-218 Doppler Velocity Sensor
- Bus Integration Computer Unit
- Integrated Display Computer Units

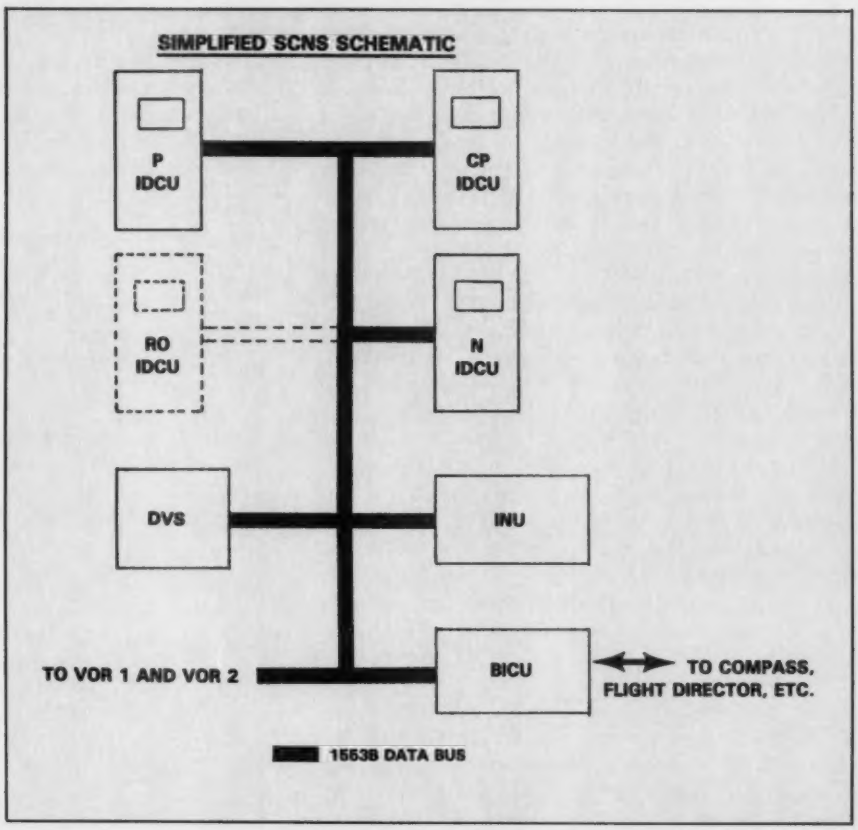
tegrated, state-of-the-art avionics system. SCNS held great promise to provide position accuracy and reduce demands on crewmembers during difficult phases of flight. The ideal system would also provide sufficient redundancy to ensure safe operations even in the event of key component failure. SCNS designers weighed these needs during development and evaluations of the highly-accurate, triple-redundant system.

Understanding and appreciating what the C-130 SCNS does best follows from knowing what comprises the integrated system. In reality, SCNS is several small, networked computers, most with built-in CRT displays and key panels, and positioned at pilot, copilot, navigator, and communications system operator (on the HC-130) stations. The small computer units through which crewmembers interact with the SCNS are called Integrated Display Computer Units (IDCUs). IDCU CRT displays are compatible with special operations night vision goggles. The backbone of the SCNS data processing network is a MIL STD 1553B communications data bus that links the computers to each other and also ties them into other C-130 avionics systems.

The SCNS derives its precision navigational accuracy from two sources: a Doppler radar system and a ring laser gyro inertial navigation system (INS). The highly-directional, low-emitting Doppler and the INS represent fairly recent technology, while other C-130 systems integrated with the SCNS are the products of former decades. What enables these old and new systems to function in the SCNS environment is a key component called the Bus Integration Computer Unit (BICU).

Like the IDCUs, the BICU is a separate, networked computer unit. In contrast to the IDCUs, it does not have a CRT or key panel and is located under the flight deck. Serving as a remote terminal on the 1553B data bus, the BICU provides a system interface for C-130 flight instruments, autopilot, vertical gyro, compasses, air data transducers, radar and station-keeping equipment on some C-130 models and affords system growth capability.

Obviously, the advent of the C-130 SCNS renders some other aircraft equipment unnecessary. To make room for SCNS, the Omega Navigation System, APN-147 Doppler radar, and other equipment items are permanently removed with the SCNS modifica-



tion. The entire SCNS hardware suite, with IDCUs, BICU, INS, and other items, is approximately a 200-pound net weight increase to the C-130's operating weight, after the weight of the removed equipment is subtracted. (See equipment list in side bar.)

However, for its weight and size, SCNS is no lightweight pretender. The navigational and systems integration benefits yielded by those additional 200 pounds is truly admirable. The SCNS delivers a broad array of functions to the C-130 aircrew. The amazing SCNS performs automated flight planning, highly precise inertial and Doppler navigation, route of flight guidance and manual or autopilot steering, centralized communication/navigation radio control and display, automatic air release point computation and delivery, nonprecision approach calculation and steering, search and rescue pattern calculation and steering, airborne rendezvous calculation and steering, extensive built-in testing, and much more.

Consider these flight planning capabilities. A SCNS flight plan can consist of up to 60 waypoints. A waypoint can be a turnpoint in the route of flight, a landing zone, or a drop zone. Waypoints can be entered using latitude and longitude or Universal Transverse Mercator coordinates. Waypoints can also be defined from up to 200 reference points stored in the BICU. These reference points may be navaid stations, visually-identifiable points, or radar targets. Also, waypoints can be defined from SCNS attributes called markpoints. The SCNS can "mark" up to nine geographical points and store them as markpoints. After all waypoints are entered and the SCNS flight plan is setup, the system displays destination arrival time, en route time, actual course, and flight plan leg distance data.

As mentioned, the SCNS uses inertial and Doppler data to achieve its precision navigational accuracy. To further improve position reliability, the system reduces errors through use of statistical filtering algorithums. The resulting "filtered" position, called the SCNS position, is one of three independent position read-outs available to crew members. Besides the SCNS position, independent Doppler and independent intertial positions can be read at any time. Of the three navigation solution positions, the SCNS position is the most accurate, rated at 0.25 nm/hr circular error. Update capabilities from visual points, radio navigational aids, celestial means, or radar on some C-130 models allow aircrews to correct system drift.

All of this means unprecendented hands-off steering and airdrop accuracy for C-130 aircrews. SCNS also means improved communications capability and an extraordinary sense of security that grows out of system reliability and redundancy.

Although initially installed for testing in only seven airplanes, the efficacy and value of the C-130 SCNS were documented by test and operational aircrews that flew the prototypes. Crews reported that improved navigational accuracy gave them more confidence during night, low-level operations. They also noted that SCNS' automation of in-flight functions allowed more time for other tasks such as threat monitoring. Tactical aircrews also sensed that with SCNS low-level steering, time control, and real-time airdrop calculations they'll be able to better handle more complex mission profiles. During search and rescue missions, crews have indicated that SCNS search pattern calculation and steering functions are freeing them for visual observation duties.

A significant operational test of C-130 SCNS took place on 20 December 1989 when a SCNS-equipped C-130 led a 15-ship formation dropping Army paratroopers and equipment in Operation JUST CAUSE. The modified Hercules again proved its combat mettle as it has through many campaigns.

Throughout this story, the C-130 SCNS has been labeled as state-of-the-art technology. It's important to mention that SCNS is designed to incorporate developing technology. A Data Transfer System (DTS) is already being tested. The DTS, available in mid-1991, will enable aircrews to automatically load flight plan data and initialize system parameters in a mere one minute, thereby drastically reducing aircraft preflight time requirements. SCNS hardware is designed to easily accommodate the next-generation instrument landing technology called the microwave landing system (MLS). Currently planned for 1992-93 implementation, commercial MLS airborne receivers will interface with the SCNS to provide precision approach guidance and steering capability. The SCNS is also designed to integrate Global Positioning System (GPS) data into its navigational positioning root logic. GPS promises to give the C-130 yet another source of extremely accurate position and altitude information. With the navigational precision needed now and accommodations for the future, the marvelous SCNS holds shining promise for the Hercules and the USAF's C-130 forces. That promise is the sweet fruit of a worthy labor.

When the Greek god Hercules finished his 12 labors, he was permitted to roam the world at will as a free spirit. But he did not choose the easy life. Demonstrating his prowess and savvy, Hercules went on to seek more adventure and to create even greater legend. Like its namesake, the C-130 Hercules has gained, with SCNS, a newfound freedom for global adventure and plenty of navigational punch to stretch its tactical airlift legend well into the 21st century.

Excellence in Airmanship

Front row, left to right: Sgt. Timothy Cole, Lt. Col. David V. Henrichsen, AC, TSgt. Conrad Brown. Second row, left to right: Capt Jeremy J. Rentschler, 1st Lt. Kevin B. Brooker. Not pictured: TSgt. Robert B. Burnett, SSgt. Wayne E. Forrer, Amn. Jonathan A. Charters, and Amn. Brett R. Cato.

Lt. Col. David V. Henrichsen and Crew, 6th Military Airlift Squadron, McGuire AFB, N.J., were flying a special assignment airlift mission to Torrejon, Spain, on 4 March 1990. The crew executed a normal departure and climb-out. About 15 minutes after level off at FL 350, with autopilot engaged and nav mode selected, the aircraft entered an uncommanded left bank. The turn and slip indicator indicated coordinated flight. However, the autopilot continued to make small right aileron inputs as shown by the autopilot aileron trim indicator. Further troubleshooting continued with the crew thinking they had a possible jammed aileron.

The crew began Dash One procedures for a jammed aileron.

Once the position of the ailerons was positively identified and both a right and left bank performed, the crew determined they did not have a jammed aileron. The crew then turned off the yaw damper to see if this would have any effect on the aircraft's performance. With this accomplished, the aircraft entered a left bank with the autopilot both off and on. Reengaging the yaw damper aided in recovery. The aircraft was now developing a moderate dutch roll. The crew determined they were experiencing uncommanded yaw in flight and applied the Dash One procedures while reversing course for McGuire.

Upon their return they entered moderate turbulence, and without the rudder and yaw damper, a dutch roll again developed (becoming severe at times) with heading changes of 10 to 15 degrees and pitch changes of up to 15 degrees. Colonel Henrichsen was about to declare an emergency when the aircraft came out of the turbulence and returned to more controlled flight.

Beginning the descent into McGuire, the crew leveled off at FL 180 and tried to regain use of the rudder using the Number 1 system. With this system repowered, the aircraft immediately went into a left roll. The Number 1 system was depowered, but when the Number 2 system engaged, the roll was even more violent. The crew determined the rudder had to be depowered for landing IAW Dash One.

Weather was clear; however, winds for the primary instrument runway (06) were out of limits (22 knot crosswinds). The crew chose to execute a straight-in to Runway 36.

Once established on final, the crosswinds (at 80 percent of maximum allowable) made the aircraft difficult to control. Colonel Henrichsen chose to use differential thrust to decrab the aircraft and thoroughly briefed procedures for landing and go around. With Numbers 2 and 4 throttles near idle power and Numbers 1 and 2 between 5,000 and 6,000 pph fuel flow, the aircraft stabilized on centerline. The crew accomplished an uneventful landing, stayed within ten feet of centerline, and taxied clear of the runway. Maintenance investigation revealed the rudder pack had been changed two weeks previously but not properly rigged. Subsequent to this flight the rudder pack was again changed with no further incidents.

Colonel Henrichsen and crew demonstrated exceptional skills which prevented loss of life and damage to the aircraft. They well deserve recognition with the MAC Excellence in Airmanship Award. *TMF* congratulates them.

Maj. Thomas A. Wick and Crew, 301 MAS, Travis AFB, Calif., were flying a night redeployment mission from Davis Fld, Okla., to Hickam AFB, Hawaii. Prior to takeoff, the C-5 crew encountered numerous flight clearance delays, a flap/slat malfunction, and engine start problems, all resolved by the crew. Shortly after takeoff, their problems continued as they experienced compound emergencies.

The aircraft departed Davis Field (uncontrolled), at 2130 CST at the heavy gross weight of 706,000 pounds. Immediately after takeoff, during landing gear retraction, the left forward main gear remained extended and the Number 4 engine overheat warning light illuminated. The crew applied maximum power to the remaining engines and continued the climb. At 600 ft above ground level, the crew shut down Number 4 engine to prevent engine fire. Flying on only three engines and heavy weight, the crew declared an emergency and diverted to Altus AFB, Okla. Cruising at 10,000 ft, they completed appropriate checklists and initiated landing-gear troubleshooting procedures. The unretracted gear, coupled with thrust loss from an engine shutdown, severely degraded aircraft performance.

En route to Altus, the crew experienced several other acute malfunctions including excessive Number 2 engine vibration, detected by the Malfunction Analysis Data and Recording System (MADAR), that required an immediate engine shutdown. Troubleshooting by the flight engineers determined that icing was causing the vibration indication, and the aircraft commander elected to continue engine operation. As they approached Altus, the aircraft experienced partial inertial navigation failure and was unable to detect wind shear. Additionally, the crew experienced an autopilot pitch trim runaway to near full nose up. Only the crew's quick reaction prevented a potential disaster as they corrected the pitch trim problem.

Despite these critical aerial emergencies, the crew was able to successfully recover the extremely heavy aircraft at Altus AFB in dangerous wind shear conditions.

The airmanship and professionalism of Major Thomas A. Wick and Crew deserves recognition with the MAC Excellence in Airmanship Award. Congratulations from *TMF*.

374th Ta
Airlift W

Anything, Anytime, An

Capt. Dwight Davidson and crew after safely landing a multiple emergency aircraft. L to R, Maj. Don Rosenberry, Capt. Dwight Davidson, Capt. Jim Platz, SSgt. John Birmingham, Jr. and SSgt. Craig Hunt.

By Maj. Dale Van De Ven
Associate Editor

Lt. Col. Ed McClure, (standing), 345 TAS/CC, with his Ops Officer Lt. Col. Larry White and current operations staff.

"Anything, anytime, anywhere." These three words accurately express the attitude displayed by the men and women of the 374th Tactical Airlift Wing, headquartered at Yokota Air Base, Japan. Col. Robert Y. Foerster, the acknowledged unit "Chief of Safety," who also happens to fill the duty of Wing Commander, gave me some insight into what he calls TAC Airlift Spirit.

Santa Claus gives a thumbs up sign during the annual Christmas drop.

"When I talk about TAC Airlift Spirit, it applies to everybody. It permeates this wing and has for quite some time. I'm talking about going out of your way and doing whatever it takes to get the job done. It doesn't mean you've got to be a C-130 guy, it means you're an enthusiastic professional, with high standards, who looks out for others and has a mission-hacking attitude."

Col. Robert Foerster, 374/CC, with C-130 maintenance.

With 23 C-130s assigned to two tactical airlift squadrons, the 21st and the 345th, it would be easy to think of this wing solely in terms of C-130 airlift—a mistake since Yokota's breadth of responsibility most certainly goes beyond the C-130 world.

Included in Yokota's arsenal

Tactical Wing

Anywhere

is the 20th Aeromedical Airlift Squadron which flies the McDonnell-Douglas C-9A "Nightingale". 1st Lt. Darren Young, one of the 374th's Flight Safety Officers and a C-9 pilot, gave *TMF* some insight into the world of the C-9.

"Our (MAC) mission is unique, because we do the same thing during wartime or peacetime. The mission is always the same, and you deal more with people than with cargo. We do whatever it takes to get the patients to their destination and pull 24-hour alerts to cover unscheduled launches. You have to be ready to go—anytime.

"Our biggest safety concern is the fact that 99 percent of our flying is over water. The lack of alternates requires special planning."

Geography isn't the only concern the 20th folks are faced with. "During typhoon season, with a storm between here and Guam, you might have to deviate 150-200 miles out of the way. Even after filling the airplane to maximum capacity, you might still be landing with minimum gas. When you're going to an island out in the middle of the Pacific, with no other place to go, it tends to make your hair stand on end."

Lieutenant Young certainly highlighted two of the concerns facing the 374th's flyers: geography and weather. While they certainly have an impact on those flying in this theater, the problems presented are not insurmountable. Lt. Col. Chris Kelly, then commander of 1403 MAS, pointed out his folks are flying C-12s and C-21s, and that while they are great airplanes, "They weren't designed to be here in the Pacific flying over vast amounts of water, and they weren't designed to do that with young pilots, many of whom haven't had experience in any other kind of overwater flight. Yet, we find a way to do just that, very safely. It all goes back to good, basic discipline—just knowing your limitations and being aware of them.

1st Lt. Darren Young, C-9 pilot and Wing Flight Safety Officer.

Not all of the 1403d's resources are located at Yokota. The unit has two dets, both with a pair of C-12s assigned. One det is at Osan AB, Korea, and the other at Clark AB, Republic of the Philippines. The Osan unit has the distinction of being one of the very few flying "remotes" in MAC, and according to Colonel Kelly, "If you want to go somewhere and do some really intense flying for a year, in one of the toughest environments as far as terrain and weather are concerned, go strap on a C-12 at Osan. It's tough flying, and they do it real well.

"I think we've got the finest Operational Support Airlift Squadron in the world. The distance we operate over water, in a theater where there are language barriers and often adverse weather, into some fields with less than U.S. standards of facilities, make it a very unique environment. If I were a young pilot looking to gain experience and do a tour in the Pacific, this would be it."

When it comes to unique working conditions, the two C-130 units assigned to the 374th just may have a corner on the market. I certainly can't think of another tactical flying unit that's located 1,650 nm from its training areas. As a result of airspace limitations in Japan, the 374th C-130 crews go to Clark AB in the Philippines for their tactical work, including regular participation in COPE THUNDER exercises. Lt. Col. Ed McClure, 345 TAS/CC, was quick to point out that, "As tactical airlifters, low level routes, airdrops, and those kind of things are important to us. These activities present some challenges. Our biggest challenge is getting our guys trained, giving them some time off, and turning them to meet normal channel and daily airlift missions. The fallout is that our guys spend 14 to 15 days a month on the road TDY, and living out of bags; it doesn't mean they're getting a lot of flying; it means they're gone."

Colonel McClure's comments were seconded by Lt. Col. Steve Sullenger, 21 TAS/DO, who summed up the C-130 situation at Yokota with these words. 'We hang our hat here, we park airplanes here, we get gas. Otherwise, we're on the road. We have to travel six hours, one way, to do tactical training. It's an amazing schedule and a scheduling personnel management nightmare, and it has to be handled very delicately.

"The young guys don't have a problem with being on the road.

They enjoy it, and many would rather do that than hang around here where it's very costly to live. Where we have problems is with the married guys who have kids and then Dad is not home very much." Colonel McClure added that "If you live on base it's not too bad; you can survive pretty decently. Most of the officers do well, but for the junior enlisted, it's tough. They're the ones that often end up off base. It can be difficult—you get kerosene heat and probably don't have a phone because few can afford the hundreds of dollars it takes to get one; and as soon as the husband leaves, the car always breaks down, the washing machine dies, and the kids get sick. Of course, the squadron is always ready to help, but it's hard on the flyers because they get hit with all these problems as soon as they get back.

"You hear how expensive it is here. Well, you can weather that and nobody's out here to get rich, so money isn't as big an issue as we sometimes make it out to be. What we do have is a good mission. Tactical airlift in the Pacific is the cutting edge for MAC. There's no peace dividend here."

My next stop was Maintenance. With all the different aircraft on the Yokota's flightline I had some questions on how the unit managed to service the various weapon systems. The answers were provided by Lt. Col. Dean Haylett, Deputy Chief of Maintenance.

Colonel Haylett made it clear that his troops had a very serious job to perform. "We have four primary aircraft types in our care and a tremendous amount of transient C-141 and C-5 traffic. We're averaging 190-200 C-141 and 50 C-5 missions per month. We also have a fairly large amount of commercial traffic which we don't maintain, but certainly get involved with on the Aerial Port side.

"It's a big responsibility to make sure the airplanes can handle long haul missions. We realize safety doesn't just happen, you have to work at it on a daily basis, at all levels, with both workers and supervisors."

Ready for the "long haul," they are. As Col. John Foncannon, 374 TAW/DO, put it, "We don't fly the flagpole at Yokota. When we saw the number of crews we had and the number of flying hours we had, we knew we couldn't survive like a normal Strat or C-130 wing. We devised a system to save postmission/premission crew rest periods. If you're out for a six-day period, we lose three days; one day premission and two days postmission. What we did was start linking missions together. We would lay out our channels and then overlay our JATT requirements or TAC trainers. It's saved the Air Force two to three hundred flying hours, but it's also saved us crew days.

"I can take a crew and keep them out on the road for two weeks, and we have increased our manpower by 25 percent by cutting down on all those postmission crew rest days.

"It's not ideal 'cause you want people to have time off. If you can give them a more extended period at home, rather than a day here and there, by putting it all together and giving them four or five days off, it makes more sense, and we try to do that."

When you take into account all the turmoil the 374th has gone through in the last year, starting with the deactivation of the 316th Tactical Airlift Group and the unit moving from its former location at Clark AB to Yokota AB, it would be easy to expect an increase in mishaps. Still, as Maj. Don Rosenberry, then 374 TAW/SE, documented, it hasn't been the case. Over the past year, the unit actually experienced an overall decrease in reportable flight mishaps. Major Rosenberry readily admits that "I'd like to take credit for the wing's success but that would be rather naive. The real credit belongs to the DO, MA, and TR communities. Safety is the business of risk management to allow successful mission accomplishment on time, the first time. That takes something no safety staff can produce—outstanding aviators, maintainers, and transporters."

Perhaps part of the explanation for this favorable mishap trend can be attributed to some concepts that Colonel Foerster pointed out, "Safety is a personal effort. It is a measure of skill, knowledge, and experience. Keeping a dynamic attitude toward each task, even those considered mundane, marks professional development. The extra effort spent following all the rules, guidance, and tech orders contributes directly to our success, and we are in a results-oriented business.

"The attitude and morale of our people is excellent. We enjoy a good mixture of flying compared to what you get in the states. We fly all over this part of the world, away from home station; crews together, on their own to do a mission. It's flying at its best."

Solar Flares, Communication, and Omega

By Maj. Stephen E. Behr
Associate Editor

March 1990 marked the beginning of the multiyear maximum in sunspot activity. During the next three to four years, solar activity will frequently interrupt Very Low Frequency (VLF), High Frequency (HF), and occasionally Very High Frequency (VHF) communications. Omega navigation signals will also be affected by solar activity since they are in the VLF band.

The current sunspot activity could be a record-setter according to the folks at Air Force Global Weather Central. Over 500 major solar flares occured from April 1989 to March 1990—all of which interrupted, to some extent, radio communications.

Radio waves are subjected to six factors affecting propagation (transmission of radio waves from a source antenna to a receiver's antenna). These factors are: diurnal effect; ground conductivity; geomagnetic field; non-spheriodal effects; modal interference; and solar effects.

Before digging into solar effects on propagation, a few words about the other factors are in order. Diurnal effect is the difference in height of the ionosphere between daytime and nighttime, and seasonal variations. In the VLF band the diurnal effect on propagation is predictable, most Omega receivers are programmed to account for it—the reason for entering a correct GMT and date. Diurnal effect also influences propagation in the HF band; the frequency guide in the Flight Information Handbook takes into account the effect (Fig. 1.); higher frequencies propagate better during daylight.

Ground conductivity affects radio wave speed and phase (change of signal amplitude). Slowing the signal phase change means a false position calculation by the receiver. Water has the least effect; ice-cap areas the most. Land mass areas have been mapped for ground conductivity data which can be stored in the Omega receiver's memory.

The Earth's magnetic field alters the motion of ions and electrons in the lower ionosphere. As the geomagnetic field changes, radio wave travel and refraction in the ionosphere are affected. The strongest disturbances of the geomagnetic field are associated with major solar flares.

Non-spheroidal effect is a result of the Earth not being a perfect sphere; aircraft altitude above the Earth's surface must be compensated for. Both factors are resolved by a computation programmed into an Omega receiver.

Modal interference is a special form of signal interference where various waveguide modes (skywave, groundwave, long path) interfere with each other and irregularities appear in the phase pattern. It is primarily a nighttime phenomenon affecting transmission paths crossing the equator. Under best conditions, one mode is dominant at all times and the phase grid would be regular. However, in the real world, a competing mode can be almost equal to the dominant mode and cause irregularities to appear in the phase pattern. The most serious case occurs when one mode is dominant at night and a second mode during the day. Liberia (Station B) is particularly susceptible to modal interference—some Omega receivers automatically "deselect" Station B at the proper times to eliminate the problem.

SOLAR ACTIVITY

There are two types of radiation from the sun that influence propagation: electromagnetic emissions and particle emissions. Electromagnetic emissions take the form of X-rays, ultraviolet light (UV), and extreme ultraviolet light (EUV). Particles from a

Distance Local Time	200-750	750-1500	1500+
0000	3.0-4.7	6.7-8.9	6.7-11.1
0400	3.0-4.7	4.7-6.7	6.7-8.9
0800	3.0-6.7	6.7-11.1	11.1-18.0
1200	4.7-6.7	8.9-13.2	13.2-18.0
1600	4.7-6.7	8.9-13.2	13.2-18.0
2000	3.0-6.7	6.7-11.1	11.1-18.0

Fig. 1. Aircrew Frequency Selection Guide (DOD FLIP Flight Information Handbook)

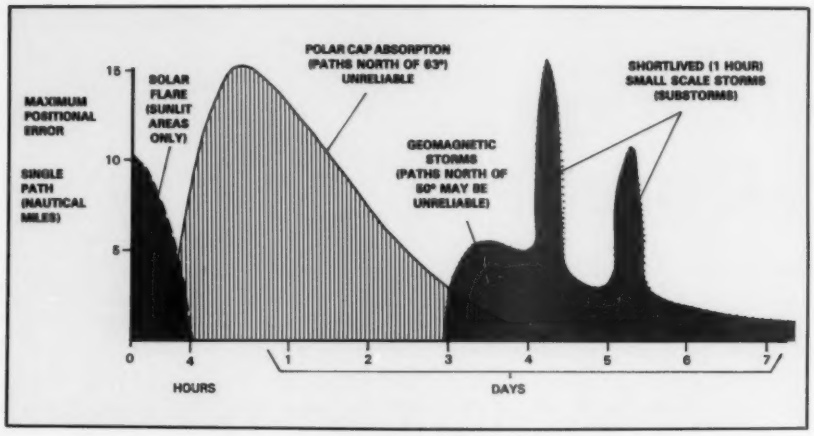


Fig. 2. Sequence of Events with a Major Solar Flare (AFM 51-40)

solar flare are either high energy (high-energy protons and alpha particles) or low energy (low-energy protons and electrons). Each type of emission has a different result on the ionosphere which, in turn, affects transmission of radio waves in the VLF and HF bands.

Electromagnetic emissions travel at light speed, reach Earth about eight minutes after a solar flare, and affect sunlit areas of the ionosphere. X-rays and UV ionize the D-layer of the ionosphere which absorbs HF energy for as long as two hours. Omega signals will be affected for up to four hours; lines of position may be shifted by up to 15 nautical miles during major solar flares. Since sunspot activity can occur on a regular cycle (27 days), warnings may be issued to alert users of Omega/VLF.

Large quantities of high-energy protons and alpha particles are infrequently released during a solar flare. These particles take from 15 minutes to several hours to reach the ionosphere. The Earth's magnetic field guides those particles into the polar regions. As radio waves bump into ionized particles, the radio wave loses some energy to those particles—the result is polar cap absorption (PCA) which may last three to four days. During a PCA event, transmission paths above 63 degrees may be unreliable, leading to position errors of six to eight nautical miles, with a single signal path error of 15 to 20 nautical miles. Navigation warning messages are issued when PCA is forecast to occur and broadcast on WWV at 16-18 minutes after the hour.

Low-energy protons and electrons travel much slower and reach the Earth 20 to 40 hours after a solar flare, just as PCA is beginning to subside. These low-energy particles result in geomagnetic storms which range from the poles to 45-50 degrees latitude. Position errors of five to six nautical miles can occur on wave paths north of 50 degrees. During these storms, indicated by the Aurora Borealis/Australis, voice communication will be poor in the HF bands.

HF FREQUENCY SELECTION

Increased solar activity isn't all bad. Strong levels of ionization allow radio waves to be refracted, which allows HF to be used over very long distances. When weak ionization is present, radio waves penetrate the ionospheric layers rather than refract. As HF frequency increases, chances for successful communication are improved over long distances.

The Aircrew Frequency Selection Guide (Fig. 1) was developed during the mid 1970s. At that time sunspot activity was at a relatively low point; a sunspot number of around 110 (111.7 is the average sunspot number for the past 200 years). At present the sunspot number is near 156. The guide provides frequency ranges where good propagation is likely over the given distances under average solar activity. Now that conditions are above average, you should start at the highest available frequencies for your location, then work down to the lower frequencies to find a band that provides the best propagation. Tuning WWV/WWVH (2.5, 5, 10, 15, and 20 MHz) will provide a good indicator of what HF frequencies to use in contacting Global Command Control Systems Stations or other HF stations.

Just as the sun is the source of life on the planet, it is also the source for ionizing energy that permits radio communication beyond "line of sight." With a little understanding of solar effects, you can overcome the frustrations of using HF radio.

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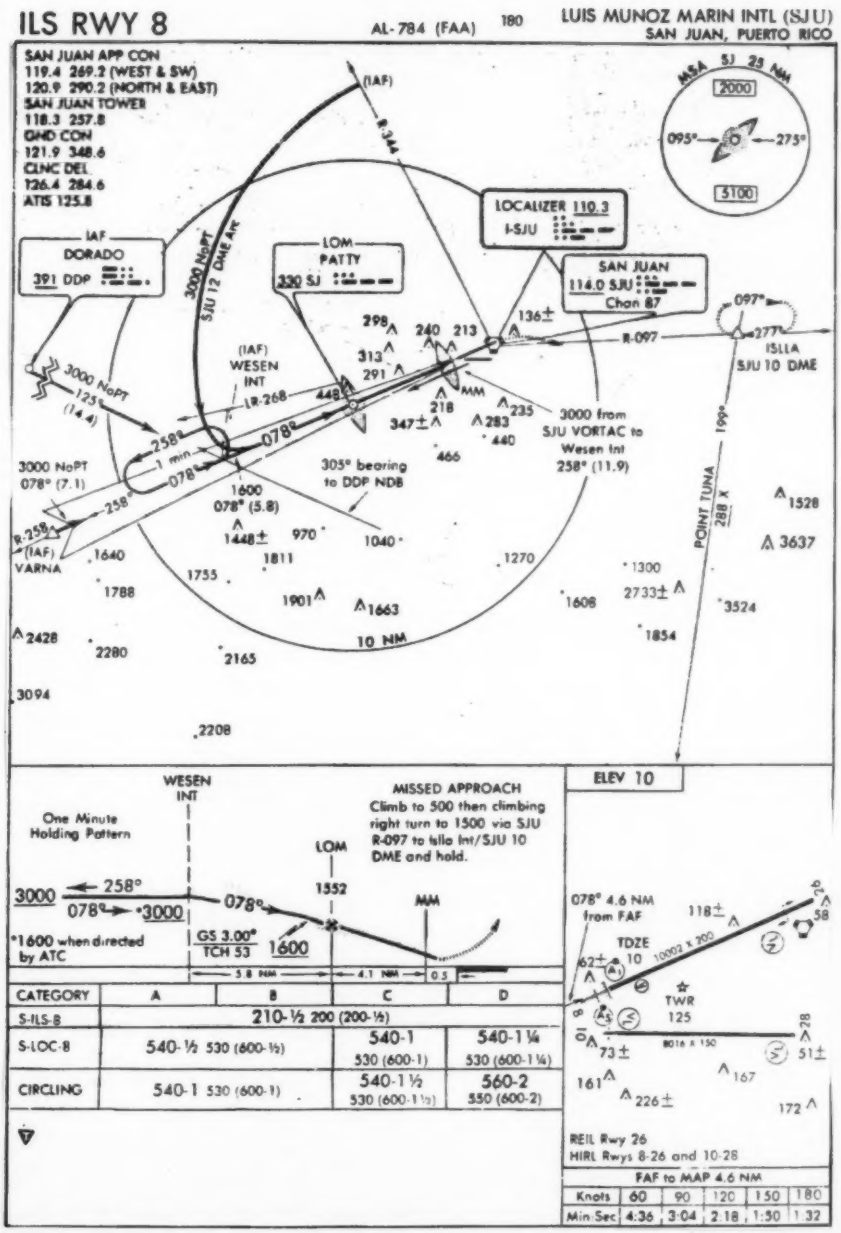
TMF Instrument Quiz

Caribbean Island ILS



CATEGORY	A	B	C	D
S-ILS-8	210-½ 200 (200-½)			
S-LOC-8	540-½ 530 (600-½)		540-1 530 (600-1)	540-1¼ 530 (600-1¼)
CIRCLING	540-1 530 (600-1)		540-1½ 530 (600-1½)	560-2 550 (600-2)

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FOR REPRODUCTION

Your mission today, should you wish to accept it, is in support of a Puerto Rico Air National Guard (PRANG) redeployment from Tyndall AFB, Fla., to San Juan's Luis Munoz Marin International.

1. Which flight plan will you use from Tyndall to San Juan?
   a. DD Form 175 (Military Flight Plan).
   b. DD Form 1801 (DOD International Flight Plan).
   c. Either a. or b.

2. Which form will you use to file a flight plan from San Juan to Christiansted, St. Croix, Virgin Islands?
   a. DD Form 175 (Military Flight Plan).
   b. DD Form 1801 (DOD International Flight Plan).
   c. Either a. or b.

3. Which ground navigation aid are you listening to when you receive the latest ATIS for San Juan?
   a. SJU, San Juan.
   b. I-SJU, Localizer.
   c. SJ, Patty LOM.
   d. X, Point Tuna.
   e. None of the above.

4. Center has told you to "expect an en route descent." It may be flown:
   a. Using radar vectors.
   b. Using nonradar routings, using navigation aids.
   c. Using nonradar routings, using approved navigation aids.
   d. Both a. and b.
   e. Both a. and c.

5. Air traffic control will authorize an en route descent when abnormal delays are anticipated.
   a. True.
   b. False.

6. The distance from DORADO to WESSEN is:
   a. 14.4 DME.
   b. 14.4 statute miles.
   c. 14.4 nautical miles.
   d. 14.4 kilometers.

7. In the CONUS, altitudes published on terminal routings are minimum altitudes and provide the same protection as an airway minimum en route altitude.
   a. True.
   b. False.

8. VARNA is a compulsory reporting point.
   a. True.
   b. False.

9. The highest obstacle depicted on this procedure is:
   a. 2,428 feet.
   b. 4,049 feet.
   c. 3,094 feet.
   d. 3,637 feet.

10. Afternoon rain showers are slowing down arrivals into San Juan. ATC clears you direct to DORADO, direct to WESSEN to hold as published. Your heading is 125 degrees. To enter holding you should:
   a. Turn right to a heading of 258 degrees.
   b. Turn left to a heading of 258 degrees.
   c. Turn left and intercept the teardrop course of 288 degrees.
   d. None of the above.

11. What is the maximum holding speed for a turbojet aircraft established in the WESSEN holding pattern level at 4,000 feet?
   a. 175 KIAS.
   b. 200 KIAS.
   c. 265 KIAS.
   d. 230 KIAS.

12. The aircraft holding below you is a turboprop. What is its maximum airspeed in the holding pattern?
   a. 175 KIAS.
   b. 200 KIAS.
   c. 265 KIAS.
   d. 230 KIAS.

13. The published glide slope intercept altitude is:
   a. 1,552 feet.
   b. 3,000 feet.
   c. 1,600 feet.
   d. 1,640 feet.

14. A common and dangerous error when flying an ILS on the flight director is to concentrate on the steering bars and ignore flight path and aircraft performance instruments.
   a. True.
   b. False.

15. With ILS selected for display on an HSI or CI, the course set knob and course selected have no effect on the centering of the CDI display.
   a. True.
   b. False.

16. On a localizer course, full scale deflection is always:

a. 2.5 degrees.
b. 1.5 degrees.
c. 3.0 degrees.
d. Differs with the width of the localizer.

17. On final approach you encounter some turbulence and notice the glide slope indication shows the aircraft is more than half scale below the glide slope. Which of the following apply?

I. Discontinue the approach.
II. Do not descend below 540 feet.
III. If the glide slope can be recaptured within one dot below or two dots above, descent may be continued to decision height.

a. I, II, and III.
b. I and III.
c. II and III.
d. I and II.

18. The vertical velocity required to maintain an angle of descent to stay on glide path is dependent upon the ILS glide slope angle and aircraft indicated airspeed.

a. True.
b. False.

THE ANSWERS

1. b. For flights that originate within the CONUS and are flown over international waters, or penetrate a costal ADIZ or foreign FIR, use DD Form 1801. (FLIP General Planning, para. 4-1.)
2. c. Either a. or b. FLIP General Planning allows the use of DD Form 175, Military Flight Plan, for flight within the San Juan Domestic Control Area. The Virgin Islands are included in the area. A DD Form 1801 would also be accepted for flight plan filing purposes. (FLIP General Planning, para. 4-1.)
3. e. None of the navigation aids shown on the approach plate has voice transmission, as indicated by a line under the frequency. (FLIP Terminal Legend.)
4. e. An en route descent may be flown either via radar vectors or nonradar routings, using approved navigation aids. (AFM 51-37, para. 10-1a.)
5. b. False. ATC *will not* authorize an en route descent if abnormal delays are anticipated. (AFM 51-37, para. 10-1a.)
6. c. 14.4 nautical miles. Ranges published along the terminal routing are expressed in nautical miles. (AFM 51-37, para. 10-6b.)
7. a. True. Altitudes published on terminal routings are minimum altitudes and provide the same protection as an airway minimum en route altitude. (AFM 51-37, para. 10-6b.)
8. b. VARNA is a non-compulsory reporting point, as indicated by the open triangle, but this would not preclude ATC from requesting you to report the point. (FLIP Terminal, Legend.)
9. d. 3,637 feet.
10. b. Turn left to a heading of 258 degrees. Aircraft heading of 125 degrees is within 70 degrees of the holding course. (AFM 51-37, para. 9-6b(1).)
11. d. 230 KIAS. (FLIP General Planning, para. 5-25a.)
12. a. 175 KIAS. (FLIP General Planning, para. 5-25a.)
13. c. 1,600 feet, as indicated by the lightning bolt symbol. It's the approximate point where glide slope/glide path is intercepted at published intercept altitude. The glide slope intercept altitude may be a minimum, recommended, or mandatory altitude. (FLIP Terminal, Legend.)
14. a. True. When using pitch and bank steering commands supplied by a flight director system, monitor flight path and aircraft performance instruments to ensure the desired flight path is being flown and aircraft performance is within acceptable limits. Failure of the flight director computer (steering bars) may not always be accompanied by the appearance of warning flags. (AFM 51-37, para. 13-1b(2)(d).)
15. a. True. The course set knob and course selected have no effect on the CDI display with ILS selected. The CDI indicates only if the aircraft is on course or in a 90- or 150-Hz zone of signals originating from the ILS localizer transmitter. The CDI always deflects to the left of the instrument case in the 150-Hz zone and to the right in the 90-Hz zone. It centers when the signal strength of both zones is equal. The CDI is displaced with respect to the instrument case and is directional in relation to the heading pointer. This is why for a back course localizer, the front course is set—it makes it simpler to fly the procedure. (AFM 51-37, para. 4-3b, 4-6e.)
16. d. Full scale deflection on the course deviation scale differs with the width of the localizer course; up to 3-degrees for a 6-degree wide localizer. (AFM 51-37, para. 4-3b(1)(b).)
17. c. II and III. Do not descend below localizer minimums (540 feet) if the aircraft is more than one dot below or two dots above the glide slope. If the glide slope is recaptured to within these limits, descent may be continued to DH. If the localizer course becomes unreliable or any time full scale deflection of the CDI occurs on final approach, the approach must be discontinued. (AFM 51-37, para. 13-1b(2)(e).)
18. b. False. The vertical velocity to maintain angle of descent to stay on glide path is dependent on aircraft groundspeed and the ILS glide slope angle. (AFM 51-37, para. 13-1b(2)(c).)

C.R. TERROR

The Tactical Technician Arrives Unannonced.

"Samuel m'boy," began the Ace of Airlift, "listen to all those overpaid commercial pilots cluttering up the airways. Everything has changed—used to be all you heard on these North PAC runs was 'MAC this' or 'Air Force that.' We had the airspace to ourselves back then.

"Why, in those days, a dollar

could really take you places; now, your per diem barely buys a good meal in town."

"Yeah Boss, I remember several trips where we got a 'Zone Cone' at Yokota but didn't get in-country," replied Lt. Blinky Donivan.

"At least Elmendorf hasn't changed," reminisced C.R. "I've been there hundreds of times; know it like the back of my hand." A hand which happened to be covered at this very moment by his emerald-green pigskin flying gloves.

As the Starlifter continued cruising toward King Salmon, the Addled Aviator recalled one of the times he was flying North PAC and received a welcome usually reserved for "Bear" bombers. It was in the early days of INS, and C.R. was operating a mission without Blinky. Evidently, the Once Pudgy Pilot's fingers pressed a wrong key on the CDU and, without Blinky along to spot the error, the Errant Airlifter wound up 180 miles off course. As a result of C.R. committing the "worst recorded navigation" error in Alaskan aviation history, Col. Fang directed scheduling to, "not let Terror fly without a navigator."

"Well, m'faithful plotter of LOPs, you can rest easy," soothed the Silver-Tongued Fox. "We made another ADIZ penetration without being challenged on guard or picking up an escort. Looks like we're gonna have a violation-free day.

"Everyone listen up, weather is still VF-an-R at Elmendorf, so I'll make my usual tactical arrival. Sergeant Downs, inform the passengers that it may get a little bumpy during the approach."

"Sure will Boss," answered TSgt. Ty Downs. "Does that mean more than one bounce? I'll brief the pax to brace for landing when the landing gear is extended."

A smile shot across Capt. "Long Suffering" Sam's face. As he listened to interphone and watched the veins on C.R.'s neck begin to bulge, he said, "Boss, I know you've been to Elmendorf a hundred times, but don't you think your approach brief was a little short? What about NOTAMS? You spent a long time looking at them."

"Samuel m'boy, those NOTAMS were the most confusin' things I've read in a long time. Just a bunch of Qs and other letters jumbled up—like QCACH—made no sense to me. Besides, I've been there a hundred times."

"Blinky, copilot. Did you copy the NOTAMS?"

"Yes, but the Chief was drinking Pang as he was getting into his seat, and the paper they were scribbled on got splashed. The Pang dissolved the pencil lead. How can he stand to drink that stuff? Anyway, when we get into radio range, you can call Base Ops and get the info."

"Gadzooks! Have you no faith? We'll get into Elmendorf, no sweat," roared the Rotund One. "Have I ever let you down?"

Not a word was spoken in reply to C.R.'s question. Sammy slouched down into the thin foam seat cushion and searched for the FLIP Alaska Supplement. Blinky returned to his study of a slightly Pang-stained chart of the Elmendorf terminal area. Sergeant Torque completed balancing the fuel and setting up the engineer's panel for descent.

Sammy dialed in Elmendorf Pilot-to-Dispatch frequency in the Number 2 UHF. As he was about to key the mike, an ELT began chirping on guard. Reaching the frustration level, he switched off guard and started to call Dispatch.

"Elmendorf Dispatch, MAC 40176, request."

"MAC 40176, Elmendorf, go ahead with your request."

"Dispatch, MAC 176. Could you get me an update on your NOTAMs?"

"Uuh, 176, standby . . . we'll call you back, we just got a report on a down aircraft. We've got emergency response checklists to run. Besides, our NOTAMs haven't changed in two days."

"Roger," was the only reply L. S. Sam could muster, knowing by the time Dispatch called back, the Starlifter would be on landing roll since C.R. was holding high on airspeed.

"Tut, tut, m'lad," as the Field-grade Fumbler disrupted Sammy's sulking. "Nothing ever changes up here. They just admitted their NOTAMS haven't changed in two days. We'll have no problems getting down on such a fine Alaskan day. Why, I can already taste a succulent crab leg dinner, drenched with drawn butter, accompanied by a few cold ones and a smoked salmon or two.

"With my contacts here, I can arrange for a delivery of fresh seafood just prior to departure. I'll let you know what's available and how much when we get into crewrest."

With that, the Master Manipulator yanked the throttles back for the descent. After a

couple of compressor stalls, the engines stabilized at idle, and the 'Lifter eased earthward. Sammy was now busy contacting Anchorage Center to inform them that C.R. had begun an en route descent at his discretion. Shortly, they were talking with Anchorage Approach Control, who cleared them for a visual to Runway 5 at Elmendorf.

"Yeeooww! Here we go for one of my patented tactical arrivals," shrieked the Ace of Aerospace. "I'll just drop down to 1,000 feet AGL so we can check out any signs of oil spillage. I want to get a positive ID on any vessels so I can make an accurate POLREP if required. That big gray one looks just like the type that would leak oil all over. I'll take us over close for a better look."

"Looks like a Naval vessel to me," called Blinky over interphone.

"Can't be too careful these days," replied C.R.

"It's an aircraft carrier, not an oil tanker. Better pull up and steer well clear of it," called Sammy.

While C.R. began his avoidance maneuver, Approach Control called and directed them to change to Tower frequency. Sammy called several times without getting a reply, while C.R. interrupted every radio call by directing a configuration change—at least they were configured for landing. An almost frantic Sammy was about to try calling on guard when he spotted a green light from Tower.

"We got a green light. Cleared to land," announced the pale copilot.

"About what you'd expect from these frontier types," chimed C.R. "Marconi must not have made it this far north."

The landing was vintage C.R.—one bounce and a tail scrape. When Sammy was able to get ground control on the UHF radio, he got an ominous message: "Call Approach Control's watch supervisor." This didn't sound like the best way to start a crew rest.

When the crew reached customs, C.R. trudged up the steps, dragging his hand-tooled baby-blue B-4 bag, hangup bag, and recently-purchased MAC treasures. It was a trip they had all made hundreds of times. After clearing customs and reloading the bus, it was off to base ops and command post to learn their fate.

Before C.R. could ask the bearded dispatcher behind the counter for dialing instructions, a very distraught looking captain burst through the doors.

"Who is the pilot of MAC 176?" demanded Capt. Kurt Kontrollem. "The FAA is going to violate him for not following the Part 93 " required altitudes in the Anchorage terminal area. The Navy is filing a report on the low pass over their aircraft carrier, and the assistant DO, Col. Ofersear, is on his way down here."

Sammy and Blinky looked at each other and knew that shortly C.R. would be make yet another trip to visit a DO—another thing he had done "hundreds of times before."

Flying-Hour Milestones

7,500

15 MAS
Capt. Kent Davis
MSgt. Stephen M. Clark
MSgt. Virgil L. Moss

50 TAS
CMSgt. David E. Rodgers
Lt. Col. William D. Greene
Lt. Col. Carl C. Powell
MSgt. Gene R. Trimmer

58 MAS
Lt. Col. Robert A. Conlee
Lt. Col. Charles I. Arms
Maj. Chandler H. Sharon, Jr.

109 TAG
MSgt. Garry A. Quick

907 TAG
SMSgt. Charles J. Farrell, Jr.

5,000

1 MAPS
MSgt. John W. Carter

11 AAS
Lt. Col. Robert M. McCarthy

15 MAS
MSgt. David R. Drew
MSgt. Steven Francois
MSgt. Dennis L. Lenhart
MSgt. Robert L. Humphress
TSgt. Walter B. Kingcade

16 TATS
SMSgt. Jerry L. Justice
SSgt. Steven M. Schade

50 TAS
SMSgt. Henry J. Allard
MSgt. Michael A. Switser
SSgt. Jeffrey D. Hamma

57 AES
SSgt. Butch O. Blake
SSgt. Anthony P. Parr
SSgt. Roland Thompson

58 MAS
Lt. Col. Honi J. Garvin
Lt. Col. Raymond D. White
Lt. Col. John I. Shinoskie
Maj. Bruce B. Stirling
Maj. Daniel K. Westmoreland
Maj. Bernie R. Sanders, Jr.

62 MAW
Lt. Col. Ronald L. Mowbray
Maj. David C. Hunn
Maj. Tony P. Exner
MSgt. Stephen R. Spotts
MSgt. Larry D. McKimm
MSgt. Ted R. Horton
TSgt. Richard L. Callaham
TSgt. Ricky L. Beavers
SSgt. Terry L. Thomas
SSgt. Scott R. Little
SSgt. Jason P. Collins

109 TAS
Lt. Col. John P. Silliman
Lt. Col. Roger N. Allen

143 TAS
SMSgt. Clarence Merry

165 TAG
Lt. Col. Johnny R. Vinson
Lt. Col. Stephen C. Lamar
Lt. Col. Richard S. Jones
Maj. Richard L. Simpson
Maj. Salvatore J. Serio
Maj. Brian K. Harris
Maj. Jefferson M. Bailey
TSgt. Richard A. Bell

166 TAG
Maj. Scott G. Allen

312 MAS
Maj. Wayne E. Marotz
MSgt. Gerardo L. Villagomez

375 CAMS
SSgt. Floyd A. Mohler
Sgt. Charles S. Decker
Sgt. Thomas M. Ronchetto

772 TAS
Lt. Col. Roy E. Moore
SMSgt. Edward Linneberger

773 TAS
TSgt. Raymon Guerrero
TSgt. James Fekete

907 TAG
Lt. Col. Louis M. Salerno, Jr.
MSgt. Timothy R. Bellamy

1375 FTS
Lt. Col. James W. Gress
Lt. Col. George T. Jenkins
Capt. Hal B. Yarbrough

Det 3, 1401 MAS
Maj. Dennis M. Shea
Maj. Donald C. Black, Jr.

2,500

3 MAS
Capt. Eugene B. Harrison
Capt. Ralph R. Griffith, Jr.
Capt. Bryan L. Waugh
SMSgt. Mark B. Smith
TSgt. Leslie W. Reeves

9 MAS
Maj. Douglas M. Newlin
Maj. Charles S. Voelker
Maj. Thomas E. Weaver
Capt. Robert F. Ulich
Capt. James L. Allen
TSgt. William A. Knight, II.
15 MAS
Capt. Gregory A. August
Capt. Christopher T. Baker
Capt. Mark A. Bliss
Capt. Andrew J. Choos
Capt. Glenn D. Martin
Capt. Craig A. Moffatt
Capt. Stuart F. Owens
Capt. Kenneth R. Wavering
Capt. Mark D. Murray
Capt. Keith Golden
Capt. David W. Peaire
TSgt. Gary W. Carter
TSgt. Brian H. Elliot
SSgt. Dana L. Brink
SSgt. Shayne T. Gasper
SSgt. William C. Marley
SSgt. Phillip A. Royce
SSgt. Brian K. Wallace
Sgt. Patrick D. Ratzlaff
Sgt. Ryen S. Hitzler

16 MAPF
TSgt. Michael L. Laird
SSgt. Donald R. Schmidt

16 TATS
Capt. Marc D. Taub

17 MAS
Capt. Dana J. Packer
Capt. Jack E. Stone

17 TAS
Maj. Michael A. Manning
Capt. Edward L. Ginter, Jr.
Capt. Kevin W. Kreps
SSgt. Edward L. Jackymack

31 MAS
Capt. Kurt D. Jones
Capt. Mark S. Michel
SSgt. Carol A. Reese

58 MAS
Lt. Col. Thornton D. Phillips, Jr.
Maj. Christopher B. Cunningham
Maj. William W. Bilger, III.
Maj. Anthony R. Watzke
Maj. Wendy J. Rogers
Maj. Wade J. Kearns
Maj. Cary B. Grant
Capt. Mark C. Coppa
Capt. Peter C. Leicht
Capt. Jerome C. Hopper
Capt. Mark K. Pearson
Capt. Kevin W. Holmes
Capt. Ira J. Holloman
Capt. Hans J. Petry
Capt. William E. Mosley
Capt. Donald E. Lotz
Capt. David E. Jakle
Capt. Terry J. Weisenfeld
Capt. Carl C. Lindenlaub, Jr.
SMSgt. William H. Dart
MSgt. Theodore S. King
MSgt. Susan A. Koch
TSgt. Garvin E. Lowery, Jr.
TSgt. Thomas J. Fischer
TSgt. Terry L. Lowry
SSgt. Carolyn D. Flores
SSgt. Derrick M. Mays

61 TAS
Col. Harvey W.C. Shelton
Lt. Col. Edward J. Feeney, Jr.
Lt. Col. Jerry L. Maddox
Maj. Henry Esposito
Maj. John D. Madden
Capt. Joe Flynn
Capt. Charlie M. Johnson
Capt. Steven B. King
Capt. Melvin Owens
Capt. Marc D. Taub
SSgt. Stephen J. Helfrich
SSgt. John L. Jaynes
SSgt. Dennis E. Veich
Sgt. Michael K. Tener

76 MAS
Capt. James S. Greene

109 TAG
Maj. Robert G. Sittinger
Capt. Michael E. Burkley
Capt. Bryan M. Fennessy
Capt. Judson T. Skaife
MSgt. Tomas Martinez
MSgt. John M. Pangborn
TSgt. Gregory D. Doriski
TSgt. Robin R. Van Ellen

143 TAS
Maj. Robert P. Horton
Capt. James J. Angarella
Capt. Dana S. Quinn
Capt. Vincent A. Rizzo
MSgt. Randolph Fitzpatrick
TSgt. Eric Hanson

165 TAG
Maj. Dennis C. Arford
Maj. Roderick A. Beard
Maj. Donald I. Cohen
Maj. Dewey L. Morgan, Jr.
Capt. Ronald C. Tidwell
Capt. Theodore H. Palmer
MSgt. Michael J. Jiran
TSgt. George E. Lovich
TSgt. Henry A. Carter

166 TAG
Capt. John M. Haskell
TSgt. Michael E. Spears

328 TAS
Capt. William D. Robinson, Jr.
Capt. Mark P. Murphy
1st. Lt. Mark B. Ables
TSgt. Leon W. Johnson

463 TAW
Col. Robert A. Maguire, Jr./CC

616 MAG
Capt. Mark A. Brenton
Capt. Robert J. Griffith

772 TAS
Lt. Col. Dan W. Hickox, Jr.
Capt. James W. Smart
Capt. Robert J. Snow
Capt. Gerald E. Sohan
SSgt. Brian D. Dedrick

773 TAS
Maj. Thomas N. Boothe
SMSgt. Joel Martinez

907 TAG
SSgt. Mark E. Durant

1,000

Det 1, 602 TACW
Capt. John B. Vittrup

Ranks and units are those at time of award.

QUICKSTOPPERS

STRANGER THAN FICTION

While cruising at FL 330, the crew of a C-21A detected a fluctuation of plus or minus 15 PSI on the Number 1 engine oil pressure gauge. All other indications were normal. The engine was reduced to idle and the crew descended to FL 190. The pressure stabilized at 30 PSI for the next ten minutes, then began to slowly decrease to below 25 PSI. The oil pressure light illuminated and the crew shut down the engine, accomplishing all checklists IAW the Dash One. After landing, both crewmembers checked the oil levels. Both were normal; however, the Number 1 engine dipstick was covered with a red fluid the crew felt was not jet engine oil. Contract maintenance took a SOAP sample, flushed the oil system, and replaced the oil filter and oil pump. A flashpoint test indicated the presence of hydraulic fluid in the oil supply.

Here's the kicker—this was the second leg of the day. The crew had no problems during the first one-hour flight. Life didn't get interesting until 30 minutes into the second leg. When the aircraft returned to home station, one can of hydraulic fluid was found missing and no servicing was annotated in the 781H. The day after this mishap, contract maintenance ordered all "beddown" bases to remove all hydraulic fluid from C-21 aircraft. Does this one make your imagination work overtime or what?

BUT HE TOLD ME TO!

A B-747 was taxiing for takeoff when an alert flight attendant spotted a smoking engine and immediately picked up the intercom saying something to the effect, "We have an engine fire, should we evacuate now?" The cockpit crew was busy and delayed picking up on the call. Someone eventually did, saying "Go ahead," meaning the person on the other end should start to speak. The flight attendant interpreted "Go ahead" as authorization to begin cabin evacuation. The passengers used emergency exits and associated slides to evacuate. Unfortunately, the aircraft was still moving, with engines running. Numerous injuries to escaping passengers resulted. Once again, a case of "What I said wasn't what you heard," this time with negative consequences. Adapted from *Kai Talk.*

TO SKI OR NOT TO SKI

The mishap aircraft was the second of a two-aircraft LC-130H airlift mission to a research camp on the central Greenland Ice Cap. The camp had been used the previous year and closed down for the winter. The first aircraft landed, offloaded, and departed, but required seven takeoff attempts to get airborne. The mishap aircraft landed and offloaded but was unable to return to the staging base due to insufficient fuel. The crew settled in for the night to await the arrival of a relief aircraft loaded with fuel and additional assisted takeoff (ATO) bottles.

The following day, while taxiing and turning onto the skiway for an ATO departure, the pilot felt the nose steering wheel turn sharply under his hand. He corrected with differential power and continued the takeoff. Upon touchdown and reverse on the hard surface back at the staging base, the aircraft veered sharply to the right. The pilot returned power to ground idle and used differential power and brakes to bring the aircraft to a stop. He deplaned the crew chief who confirmed damage to the steering collar. Investigation revealed it had broken where the left steering cylinder attaches, and the lower scissors attach fitting of the nose strut had cracked. This failure was almost identical to a Class C Flight Mishap in Nov. 89 to which AFLC responded, "Failure does not necessarily indicate a deficiency in design of the area." Kind of makes you wonder how many failures it takes, doesn't it?

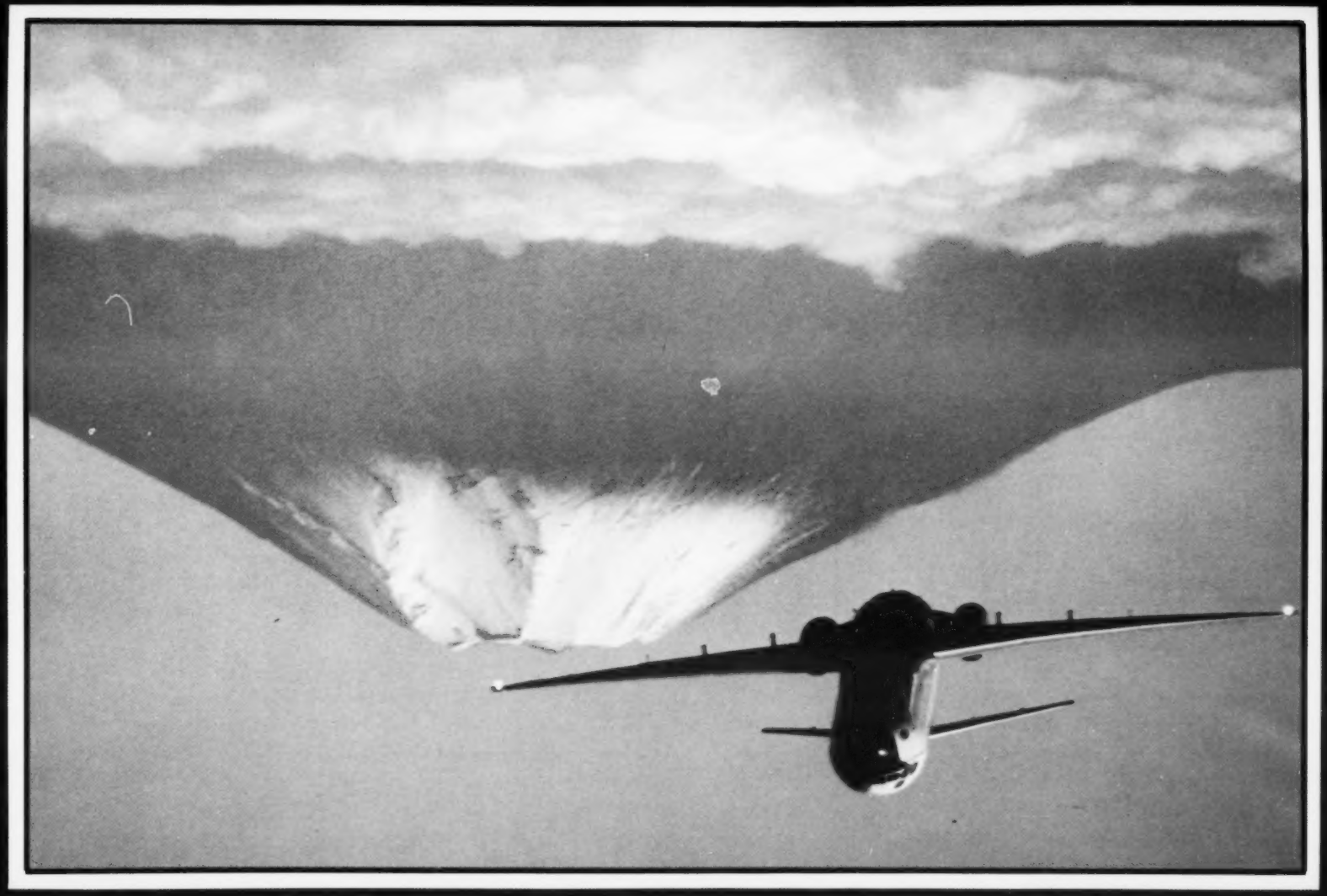
RUDDER? WHO NEEDS IT?

While flying a simulated three-engine circling approach, the mishap C-141 pilot applied left rudder to counter the yaw induced by retarding the throttle. In the final turn, at approximately 600 feet AGL, the crew heard a loud bang accompanied by an illuminated yaw damper fail light and immediate yaw to the right. The pilot performed a go-around and a chase plane confirmed there was no visible damage to the rudder. Since the winds were out of crosswind limits at home station for landing without an operable rudder, the crew diverted to a nearby NAS and landed without incident. Investigation revealed both sides of the power output lever had broken where it connects to the actuator arms of the rudder pack. The unit submitted an MDR . . . awaiting results. This almost sounds like the kind of stuff for an Excellence in Airmanship Award.

After Deadlines

C-130s HELP RETARD CALIFORNIA FIRES - Eight Hercules aircraft equipped with Modular Airborne Fire Fighting Systems helped contain fires in the Santa Barbara and San Diego county areas during July. Units participating in the aerial assault on the fires were 943 TAG (AFRES), March AFB, Calif.; 146 TAW (ANG), Channel Islands ANGB, Calif.; 153 TAG (ANG), Cheyenne, Wy.; and 145 TAG (ANG) Charlotte, N. C. Each unit provided two C-130s during three days of fire fighting operations. Each C-130 carried 3,000 gallons of fire retardent weighing approximately 26,700 pounds. A total of 78,000 gallons of retardent were dropped over the three-day period. (U.S. Forestry Service photo.)

WALKMANS NOW ALLOWED ON MAC AIRCRAFT - The Air Force has approved a MAC request for inflight use of Walkman-style radios and recorders by passengers aboard MAC aircraft. The "Walkman waiver" covers battery-operated, hand held/pocket size tape recorders and radio receivers. These devices may only be used while the aircraft is at cruising altitude.

HELP ON THE HIGH SEAS - Members of the 1730th Pararescue Squadron at McClellan AFB, Calif., dropped medical supplies to a 45-year-old American stricken with asthma on a sailing vessel between Peru and Hawaii on June 29th. A MAC C-141 Starlifter from 63 MAW, Norton AFB, Calif., carrying a doctor from Beale AFB, Calif., and the pararescue team, performed the 14-hour mission. The cannister landed 10 feet from the bow of the vessel making it easy for the stricken man's wife to retrieve. Following consultations between the wife and doctor by radio, the medicine was administered to the stricken man and he began to show immediate improvement.

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